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Co-design for accessibility in academia for Deaf students

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ABSTRACT

Learning opportunities for students with diverse needs in higher education have increased in recent decades. Consequently, university faculties need more evidence-based information about how students with diverse needs make the sense of the curricula. This paper presents findings from two co-design projects made at the Aalto University in collaboration with Deaf communities. It argues that the involvement of Deaf users in the design process can produce better digital environments in terms of (1) creating visual approaches designing interfaces and (2) providing new tools that advance the user experience of many other user groups such as dyslexic students and visual learners.

KEYWORDS

Co-design, Accessibility, Collaboration, Higher Education, Inclusion, E-learning

INTRODUCTION

Learning opportunities for students with diverse needs in higher education (HE) have increased in recent decades. Consequently, university faculties need more evidence-based information about how students with diverse needs make sense of the curricula. Recently our ideas of design, learning and possibilities for the knowledge building have drastically changed, but the higher education in many countries has remained the same for centuries (Raike 2011). Students of higher education arguably take too many years in acquisition-oriented studies without developing their own undertakings, which would genuinely advance their knowledge (Mandl, Grüber & Renkl 1996).

A person with disabilities (PwD) in HE is considered as a student with "special needs". In this article, we use a term "diverse needs" instead to address the fact that the question is about diversity rather than just needs that differ from what is considered normal or typical. Designing enabling environments rather than concentrating solely on special education and services could promote this. Thus, a holistic approach to inclusion is needed that perceives the students – regardless of their disability– as active members of the academic community of practice.

In HE context technology-enhanced learning environments provide new tools and practices for learning. These environments make it possible to take into consideration the individual needs of the diverse students and give them more opportunities to participate in higher education. We argue that this goal can be achieved through co-design that typically aims to re-focus the diverse objects of activity towards shared outcomes, producing communal artifacts for all stakeholders. We will use the term 'co-design' to cover co-design, participatory design and some methodologies of user-centered design although we are aware of the differences between these various methodologies in present design research. According to Kuutti (2007) an interesting development is happening within the academia itself, which seems to be pointing in a direction where existing disciplines imitate the design way of producing knowledge. Hence, we clearly need to consider models that advocate more contextual, situated, and nuanced understanding about the diverse needs of students.

In this paper, we will focus on students who use Finnish Sign Language in university studies. We will present findings from two co-design website projects made at the Aalto University in collaboration with Deaf communities. The first case is the CinemaSense (2000–2004) project, a participatory action design project with Deaf university students. The second case is the Knack project (2008–2009), a participatory design research with Deaf participants to improve user experience of Deaf related websites. Both projects were executed iteratively and in collaboration with users, designers and researchers, both claiming a much stronger visual presence than was habitual in the web platforms of their times, defending the right to pack information and communicate using a Deaf perspective.

The projects demonstrated the importance of involving the users as participants throughout the design process, and thus, the significance of co-design with Deaf communities is further examined. We propose that similar methods can be applied in the production of multi-modal web courses, interfaces, and services that, for their own part, promote inclusion as well as multi-cultural and flexible university studies.

THEORETICAL BACKGROUND – INCLUSIVE TECHNOLOGY ENHANCED EDUCATION

Designers have noticed the usefulness of inclusive co-design for everyone: good design challenges the old paradigm of “special needs”. Involvement of user communities is especially important when services and products are developed for purposes of inclusive education (Keates & Clarkson 2003). Carey (2005) summaries that all the components for effective accessibility in converged digital data ecology do exist, but they need to be creatively combined, that is, designed. ‘Design’ refers to planning, shaping, giving form, and developing a product or a service. It not only involves the design of an artifact, but also exploring, testing, and cultivating social systems and practices related to the use of the artifacts; hence the latter processes may be considered as an essential aspect of designing.

Due to the diversity, it is difficult to create content that is accessible for all without providing flexible learning environments. For instance, a solution designed for a blind student may run counter to the benefits of a deaf or dyslexic. This is why the students should be allowed to participate in the design process of these environments. We argue, that through co-design we can take into consideration the diverse needs of participants and reveal the tacit knowledge involved that is not directly detectable by any external observer.

Bad usability and user experience can make learning agonizing. User experience is essential part of good design and effective accessibility. In order to enhance user experience, it is important to identify the features that are likely to facilitate product acceptance. This includes respecting users and commitment to user needs and desires. Krippendorff (2006) argues the need for a semantic turn in design and proposes that design involves an “understanding of the understanding of others”. The large majority of research concerning interface design for "disabled" people, including non-sighted and Deaf users among others, takes the assumption of deafness as a medical disability for granted. Research in the area lacks the examinations of the relation between Deaf people and interfaces in their social context; that is, how Deaf people constitute meanings, how these meanings affect interactions, and how to organize the content in the way that reflects the world as Deaf people perceive it (Woolley 2010).

The design challenge for CinemaSense and Knack project was to create conditions for the objective study of a subjective topic, that is, how Deaf users evaluate websites and how web based course material should be structured. We used co-design as a formative intervention (Pullin 2009) to

give space to Deaf expertise and open up a way to build motivation, or more appropriately, to turn motivation into agency. Naturally Deaf people are the experts in their own motivation, including critical awareness of factors that prevent or distort their motivation to learn or use websites.

CINEMASENSE – A COLLABORATIVE EFFORT TO LEARN FILM WITH DEAF STUDENTS

CinemaSense is a user-interface of collaborative learning, web-based study material, web portal, and service. It was both the aim of the study, one of its methodological instruments, and the most important outcome of the project, i.e., an independent design artifact for its own sake. The research and design process of CinemaSense is reported in detail in other articles (Raike 2005; Raike, Botero & Rodríguez 2003; Raike 2006; Honkela et al. 2000; Raike & Hakkarainen 2009); the present chapter focuses on examining the role of Deaf participants who had an essential role in the iterative development of CinemaSense. The project, qualitative in nature, was realized already at the beginning of 2000 (Raike 2006). Instead of "a rigorous educational film program" for Deaf schools, the CinemaSense co-design project was realized with future Deaf class teachers and potential Deaf and hearing filmmakers and students of art in higher education. Instead of an educational film program a visual educational web-based learning tool was created that, after a decade, is still in use as an open access study material (http://elokuvantaju.aalto.fi, Figure 1).

Figure 1. The CinemaSense learning module El Doble with Columbian Sign Language. Colombian Sign Language signs are provided for concepts explained in Spanish. The signer is Colombian fashion designer Andrea Rodríguez Escudero. The signs were selected and translated by Deaf media professionals (http://elokuvantaju.aalto.fi/spanish/authors/colombia_team.jsp).

The co-design part of the project in 2000–2001 aimed, first, at examining how inclusive art studies can be implemented in practice and how to support the accessibility of film studies (Raike 2005). The second aim of the CinemaSense project was to analyze the Deaf students' knowledge building and conceptualization related to film expression, as well as their collaboration during the web-based course. The third aim was to analyze how the imitation of professional production of a documentary film facilitates the development of CinemaSense: How does the overall film production from an idea to finished product become structured through web-based learning so as to fit the three stages of film production, i.e., pre-production, production, and post-production? Participation in genuine film production was intended to guide participants in problem-driven learning in which each student may assume an expert's role and engage in solving corresponding problems in practice.

In developing tools for collaborative learning, one cannot advance straightforwardly from idea to their implementation; a more complex process in needed in which ideas and visions co-evolve with the experiences and practices of the user communities involved (Greenbaum & Kyng 1992; Engeström & Middleton 1999). Thus an essential aspect of processes of CinemaSense kind is their iterative nature where the formative intervention overlaps with the production. One of the methodological challenges was to examine how the accessibility of academic studies in an artistic institution can be elicited. What kind of methods and services are needed to make basic film studies accessible to Deaf students? Toward that end, the CinemaSense project involved parallel pursuit of developing the web service and analyzing the conceptualization of cinematic expressions with the help of two student groups.

The first 'Novice Group' consisted of seven Deaf class teacher students who engaged, during 2000–2001, in a two-year web-based study concerning cinematic expression, culminating in 2002 making their own documentary film. There were six out of seven participants who considered themselves Finnish Sign Language (FinSL) users whose second language is Finnish; the seventh participant was also confident with FinSL. The 'novice' participants were majoring in education and aiming at becoming class teachers at the primary level of education, after getting their master's degree based on five-year study.

The 'Expert Group' consisted of five full-time Finnish-speaking MA film students majoring in film art from the (present) Aalto ARTS. These students aimed at becoming professional filmmakers either as directors, film editors, cinematographers, or producers. After either a three- or five-

year study program, they aimed, respectively, at becoming candidates or masters of fine arts. Consequently, this group was, in a concrete way, intellectually socialized toward appropriating a filmmaker's perspective on film art.

The groups resembled each other in respect of the members' ages (M=28, SD=26) and number of languages mastered. The diversity of the groups was a consequence of an intentional choice aimed at understanding various aspects of learning film art relevant from the perspective of designing CinemaSense; Raike (2005) sought to use the diversity as a productive instrument for collaborative learning about film art through enactive filmmaking instead of examining how the Deaf users' learning differed as such from that of hearing students.

The ways the 'expert' participants conceptualized films provided a comparison base for assessing the Novice Group's evolving knowledge and expertise of film art. Using concept maps, two groups' evolving cinematic knowing was examined and utilized while developing the map-like user interface of CinemaSense across three iterative design cycles. During the co-design, the Deaf students analyzed films, wrote about their own experiences, and represented their evolving cinematic knowing through constructing concept maps (Raike & Hakkarainen 2009).

It appears that, when used in conjunction with collaborative learning environments, web-based study materials, such as CinemaSense, can be productively utilized to support the learners' own knowledge seeking inquiry, driven by their own questions and wonderments, instead of merely to assimilate existing information (Hakkarainen et al. 2004). Hence a collaborative activity itself empowered the Deaf students to contribute in a meaningful way. In addition, Deaf students with a sight-based orientation to the world contributed to a multilayered visual presentation in CinemaSense, which offered a novel insight and option compared with pure textual content presentation style that was dominant in early 2000's.

KNACK – DESIGNING A DEAF CULTURE SPECIFIC WEBSITE WITH DEAF USERS

Knack is a web design project by the Finnish Association of the Deaf (FAD) in 2008–2009. The www.knack.fi website was part of a larger Osata project run by FAD where the primary aim was to raise awareness of learning disabilities in Deaf and hard of hearing children as well as adults (Rainò 2010). Altogether sixteen members of the Finnish Deaf community (all Finnish Sign Language users) participated in the study. Participants were selected through purposive sampling based on the following: they are

stakeholders of the project; have an interest in the design; and are willing to support and constructively criticize the development. They presented a wide range of Deaf community members whom two were hard of hearing and fourteen were Deaf of which four were dyslexic.

The primary aim of Osata was to raise awareness of learning disabilities in Deaf and hard of hearing children as well as Deaf adults and to promote the new methods of remediation. The knack.fi website was designed to encourage Deaf and hard of hearing children to explore rhythmical plays and exercises based solely on visual and kinesthetic impulses. The multisensory training of rhythmic increases attention and develops early reading and writing skills but it is considered beneficial even for dyslexic adults (Overy 2009).

The study aimed to understand the implications of Deaf culture and Finnish Sign Language as a first language on web user experience. The main driving force to this applied research was to tackle the problem of Deaf users being unsatisfied with sites that are designed for them. Even websites that meet the accessibility criteria – and sometimes them especially – did not seem to attract Deaf users. When interviewed during the preliminary research, a group of Deaf people stated that they are unable to engage with most websites for three reasons: firstly, they were not in their own language, secondly, accessible sites look boring and ugly, and thirdly, they did not feel at home when using them.

In the course of the research, co-design research methods were used to help in understanding the 'native' point-of-view. The design process involved three main phases: (1) contextual inquiry through observation and stakeholder meetings; (2) the identification of Deaf culture specific design features through a focus group session, card sorting, and thematic interviews; and (3) the integration of the identified design features by way of a brainstorming session, two collaborative workshops, and development of prototypes in collaboration with Deaf designers. Ideas and experiences from every session were fed back into the following workshops and finally into the development of prototypes. The purpose of the study was not to research quantitative or an object research 'truth' in its traditional terms, but rather to look for inspirational and actionable insights on culturally rooted conventions that influence user experience.

The participants emphasized their frustration with the long paragraphs of text, lack of images, slow uploading times, and overly textual navigation. Even if the participants were overwhelmed by text, some stated that they preferred text to sign videos: One has to wait for videos to stream; text on the other hand can be scanned and read quickly. Most participants,

however, would prefer signed communication to text if available. All the participants used both mediums and expressed that the one they used varied from day to day.

To make a distinction between participants' favorite websites and the ones they used in practice, it became evident that the most used sites were news portals, designed for hearing people. However, when asked about sites that brought them enjoyment, paradoxically, they showed the examples of sites targeted towards Deaf users. Most participants said that they would visit Sign Language websites if they were better designed and offered content that interested them. The dialogue below illustrates that also the characteristics of the signer were important for Deaf participants:

> *"I like the French site. Let me see if I can find it. Here it is. You see. The signer is engaging and funny, interesting to follow. I also like the symbols they use for navigation. It's easy to explore even if I don't know any French. The way the signer is placed on the site is also different to what one normally sees on a website. Mew... I don't like the way it's inside that box though."*

> *"Yeah, I don't like that either. You know the site... wait a moment. Here it is. This is a Finnish site. I like that the man is standing there freely. Though he is too small in size. It's hard to follow. But somehow it feels like it belongs there. It tells you what is there. I like that. But otherwise there is too much text on the site, and I don't like the colors. They are boring."*

Following this line of thought later in the study another participant stated:

> *"... Expressive. The signer needs to be lively, creative. Humor is always good. Not too serious. There should be some kind of liveliness."*

In addition, the visual surrounding was an important part of the design for the participants as the following comments from different participants during a workshop session illustrate:

> *"The signed videos with plain backgrounds do not invite to follow what is being signed."*

> *"Blank backgrounds do not even arouse my interest to follow the signing."*

The following summaries the focus group findings in which seven recurring themes could be identified: these were (1) simplicity and clarity; (2) visual guidance; (3) vividness and engagement; (4) charismatic signer; (5) non-isolated signer; (6) the clarity of the signing; and (7) the speed of the website. The design process showed that even if visually engaging content was the key to liking an interface, ease-of-use and speed were as important factors for Deaf participants. A signer on a website did not only bring

functional value as such but it brought added value by giving access to their mother tongue. In addition to Sign Language content, participants yearned for visual guidance such as icons on navigation; photos to illustrate the context of signing; colors to visually differentiate different sections of the site; and visual responses to mouse movements (Figure 2).

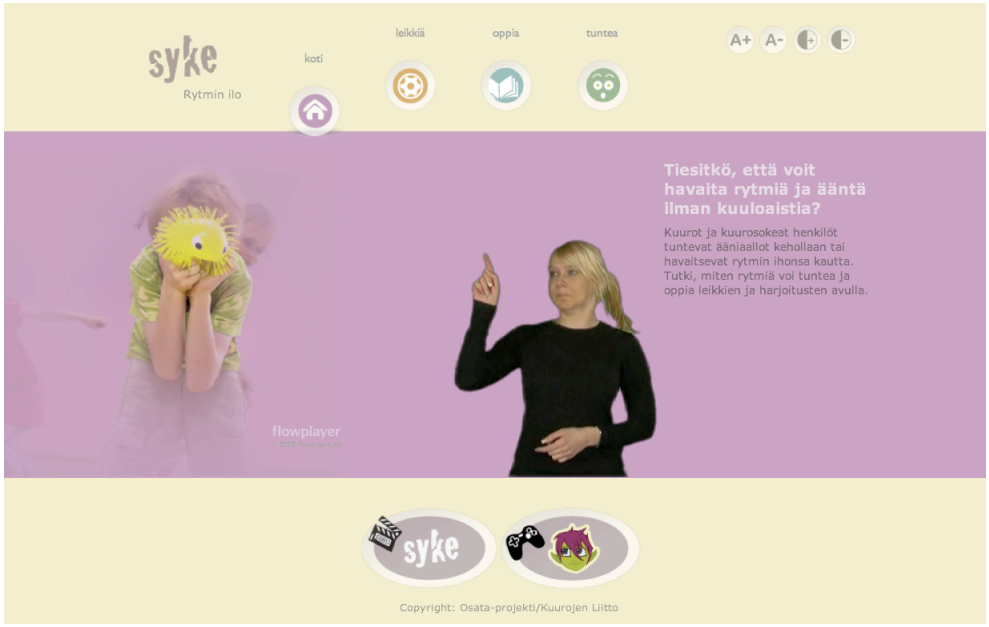

Figure 2. The user interface of Knack website gives visual feedback to its users through color coding and animated icons.

Even if many of the findings are in line with general usability guidelines, it is important to realize that the needs of Deaf users differs somewhat from mainstream users. Even though Deaf people do not face as strong physical barriers in accessing content as blind and vision-impaired people do, there are mental barriers that may be as limiting. For example, the lack of confidence in writing skills may prevent people taking part in text-based discussion forums; inability to use one's mother tongue may cause frustration; and unclear guidance may prevent people using the site. Additionally, the style in which information is told is important to Deaf users: it determined their willingness to explore the site.

Some of the findings may also apply to hearing people; thus, they should not be treated as a list of differences but rather as a list of issues to be considered when designing for the Deaf community. The design research suggests that the visual features of an interface may be even more important for Sign Language users than for mainstream users. Consequently, they have a smaller tolerance to visual clutter (Rosenholtz, Li & Nakano 2007) and discontinuity in design. This may also bring a new perspective designing for other user groups such as for elderly and dyslexic users who are visually oriented due to short-term verbal memory.

The term ‘accessible’, in this case, has been diverted along with the Deaf co-designers to mean something unexpected: added visual aesthetics and moving images on the one hand, and partially text-based information even for dyslexic Sign Language users, since signed information may not always be optimally memorized. This collaborative activity brought about new perspectives in accessible web design: accessible web portals should not automatically mean 'boring, stripped-down information' with no images and movement as it often is today.

FINDINGS AND CONCLUSIONS

Despite the design challenge of creating accessible user interfaces, the needs and requirements of inclusive education have been theoretically examined (Adams & Brown 2006; Riddell, Tinklin & Wilson 2005; Seale 2006) and technology needed for the practical implementation is already available. The iterative collaboration with Deaf students revealed how the accessibility of tools and technology is indeed the issue for effective collaboration (Woolley et al. 2010) and learning.

Simultaneously, CinemaSense and Knack aimed at creating a set of visual web-based study material. CinemaSense helps in understanding film as a product of cultural – even a transcultural – activity. In the case of Knack, a pilot website was created as a hypothesis of the kind of interface that is enjoyable by Deaf community based on their ideas developed in workshops. The results of the co-design projects are closely tied to the opinions of Deaf users. There may be several issues that the studies have not touched upon; the co-design methodology relies solely on participants to bring about the issues they are concerned with. Nevertheless, agendas given by members of the culture are ones that they are concerned with, and thus, important to them. Thereby, it can be assumed that the results can contribute to the processes of designing accessible learning environments in the future.

We are convinced that it is essential to understand how Deaf students, as visually oriented people, conceive of learning, knowing and collaboration in order to promote efficient approaches to learning and tuition in all levels of education. Raike (Raike 2005; Raike & Hakkarainen 2009) revealed how the accessibility of communication tools and technology is indeed the issue for effective collaboration. Moreover, Kitunen (2009) claims that – in addition to accessibility – the design process needs to understand the cultural needs of Deaf users that cover both visual and functional aspects of such tools.

The aim of a co-design project is typically to re-focus the diverse objects of activity within such practices towards shared outcomes, producing

communal artifacts for all stakeholders. Involving Deaf users in the design process we can produce better digital environments in terms of (1) creating visual approaches designing interfaces and (2) providing new tools such as video based discussion forums that advance the user experience of many other user groups such as dyslexic students and visual learners.

Obviously the issue is not so simple and actors in education should consider more the role of learners' activity as an essential part of developing learning environments for Deaf. Hence, actors need to be concerned about the possible benefits of conceptualization in the Deaf way, given the importance of divergent thinking for creative tasks. This in turn augments Deaf professionals' abilities to interpret and evaluate any information and to make decisions vis-à-vis the multifaceted problems of the world.

LIST OF REFERENCES

Adams, M. & Sally B. 2006. *Towards inclusive learning in higher education. Developing curricula for disabled students*, Routledge, New York, NY.

Carey, K. 2005. Accessibility: The current situation and new directions. *Ariadne* Issue 44, http://www.ariadne.ac.uk/issue44/carey [Accessed 13 May 2013]

Ehn, P. & Badham, R. 2002. Participatory design and the collective designer. *PDC 02 Prodeedings of the Participatory Design Conference, Malmö*, Sweden, 23-25 June, ed. T. Binder, J. Gregory, & I Wagner, pp. 1-10. http://ojs.ruc.dk/index.php/pdc/article/view/235/227 [Accessed 23 January 2013]

Engeström, Y. 2011 From design experiments to formative interventions. *Theory & Psychology*, pp. 598–628, doi:10.1177/0959354311419252.

Engeström, Y. & Middleton, D. 1999. Cognition and communication at work, Cambridge University Press, Cambridge, MA.

Greenbaum, J. & Kyng, M. 1992. Design at work: Cooperative design of computer systems. Hillsdale, NJ, USA: L. Erlbaum Associates.

Hakkarainen K., Palonen, T., Paavola S. & Lehtinen, E. 2004. *Communities of networked expertise: Professional and educational perspectives,* Elsevier, Amsterdam.

Mandl, H., Grüber, H. & Renkl, A. 1996. Communities of practice toward expertise: Social foundation of university instruction. *Interactive minds. Life-span perspectives on the social foundation of cognition*, ed. Paul B. Baltes and Ursula M. Staudinger, Cambridge University Press, Cambridge, pp. 394–412.

Keates, S. L. & Clarkson, J. P. 2003. *Countering design exclusion: An introduction to inclusive design*, Springer, Berlin.

Kitunen [Pylvänen], S. 2009. Designing a deaf culture specific web site – participatory design research for knack.fi, MA thesis, University of Art and Design Helsinki.

Krippendorff, K. 2006. *The semantic turn: A new foundation for design*, CRS Press, Boca Raton, FL.

Overy, K. 2009. Classroom rhythm games for literacy support. *Music and Dyslexia: A Positive Approach*, ed. T. Miles, J. Westcombe and D. Ditchfield, John Wiley & Sons, Chichester, UK, doi: 10.1002/9780470988183.ch4.

Pullin, G. 2009. *Design meets disability*. The MIT Press, Cambridge, MA.

Raike, A. 2005. Löytäjät elokuvantajua rakentamassa. Yhteisöllinen WWW-palvelun tuotanto, Doctor of Arts diss, University of Art and Design Helsinki.

Raike, A. 2006. Searching knowledge CinemaSense as a case study in collaborative production of a WWW service in two universities. *Computers helping people with special needs*, ed. Klaus Miesenberger et al., Vol. 4061, Springer, Berlin/Heidelberg, pp. 568–574.

Raike, A. & Hakkarainen, K. 2009. Concept maps in the design of an accessible CinemaSense service. *Art, Design & Communication in Higher Education, Vol.* 8, No. 1, pp. 27–55, doi: 10.1386/adch.8.1.27_1.

Rainò, P. 2010. Osata-projekti 2007–2009, loppuraportti. Osata Project 2007 - 2009, Final Report, Finnish Association of the Deaf, Helsinki.

Riddell, S., Tinklin, T. & Wilson, A. 2005. *Disabled students in higher education. Perspectives on widening access and changing policy*, Routledge, New York, NY.

Rosenholtz, R., Li, Y. & Nakano, L. 2007. Measuring visual clutter, *Journal of Vision,* Vol. 7, No. 2, pp. 1–22, doi:10.1167/7.2.17

Seale, J. K. 2006. *E-Learning and Disability in Higher Education: Accessibility Research and Practice*, Routledge, New York, NY.

Honkela, T., Leinonen ,T., Lonka, K., & Raike, A. 2000. Self-organizing maps and constructive learning. *Proceedings of Conference on Educational Uses of Information and Communications Technologies,* 16th IFIP World Computer Congress, Beijing, China, August 2000, ed. D.H. Benzie and D. Passey, Publishing House of Electronics Industry (PHEI), Beijing, pp. 339–343, doi: 10.1.1.117.2706

Woolley, A. W., Chabris, C. F., Pentland, A., Hashmi, N. & Malone, T. W. 2010. Evidence for a collective intelligence factor in the performance of human groups. *Science,* Vol. 330, No. 6004, pp. 686–8.